DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 15-19, 22, and 24 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. With respect to Claim 15, the limitation of 3 μm as the R_{max} surface roughness measured according to JIS B0601 as the lower range in line 18 of the Claim is not supported by Applicant's Specification as originally filed. Although a limitation of 3 μm is disclosed for surface hardness (see Specification, p. 19, ex. 1, ll. 14-32), such measurement is not disclosed for R_{max} surface roughness measured according to JIS B0601. Claims 16-19, 22, and 24 are rejected via their dependency.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 15-19, 22, and 24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With respect to Claim 15, the limitations of a “surface roughness of 3.2S – 6.3S and R_{max} of 3 – 6.3 μm” in line 18 of the claim contain different presentations of the same unit of measuring maximum surface roughness (S and [R_{max} and μm]) and contain different precisions of the surface roughness bounds (3 and 3.2). With respect to the different presentations of the same unit of measuring maximum surface roughness, since the claim does not indicate the second presentation as restating the first presentation, the limitation of the first presentation is no longer clearly directed to a surface roughness as a value of maximum height R_{max} (see Specification, p. 14, l. 20 through p. 15, l. 9). With respect to the different precisions, since the different precisions limit values of surface roughness that would be included within the claimed range above 3 or 3.2, the ranges constitute a broad range with a narrow range. A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App.

1949). In the present instance, claim 15 recites the broad recitation “3 – 6.3 μm,” and the claim also recites “3.2S – 6.3S,” which is the narrower statement of the range/limitation. For purposed of examination the, the Examiner assumes the limitation 3 – 6.3 μm as the R_{max} surface roughness measured according to JIS B0601. Claims 16-19, 22, and 24 are rejected via their dependency.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 15-19, 21, 22, are 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujimoto (European Patent Application Publication No. EP 1033422A1) in view of Rowan et al. (US Patent No. 4,851,172), Toshio et al. (Japanese Patent Publication No. JP 52066769 A), Palmer (US Patent No. 4,529,655), and Matsuo (Japanese Patent Publication No. JP 11-100747), solely, or further in view of Negishi et al. (US Patent No. 4,069,565).

With respect to Claim 15, Fujimoto teaches a method of producing a poly (trimethylene terephthalate) fiber where the yarn is drawn, heat treated and then subjected to a relaxation treatment (a polymer substantially comprising polytrimethylene terephthalate) [0035]. The intrinsic viscosity of the polymer is 0.4 – 1.5, preferably 0.7 – 1.2 (intrinsic viscosity at least 0.7) [0016]. In the process, the multifilaments are extruded from a spinning machine (method of producing multifilament yarn; melt

spinning) [0035] and wound round a first roll heated at 30 – 80 °C and then a second heated roll at 100 to 160 °C (hauling off the multi-filament yarn via a first heated roll; second heated roll; subjecting the multi-filament yarn to a heat-treatment at the second roll; subjecting the multi-filament yarn to a relaxation heat treatment; the second heated roll at 105-180 °C) [0038]. The multifilaments are wound around a first roll at a speed of 300-3,500 m/min (at a spinning rate of at least 2,000 m/min) ([0036] and [0037]), drawn in a single drawing step between the first roll 11 and a second roll 12 at a ratio of 1.3 to 4 (subjecting the multi-filament yarn to drawing without winding up between the first heated roll and a second roll at low draw rate) [0038], wound round the second roll (by plural laps of the yarn) [0036], relaxed at a ratio of 0.8-0.999, with the ratio being the winding speed/peripheral speed of the second roll (at a relaxation factor of 10-20%) [0040], mixed by methods such as interlacing before incorporating the yarn into fabric (subjecting the multi-filament yarn to an interlacing treatment) [0045], and wound up on a winder (and winding the multi-filament yarn up as a package) [0036].

"[B]y employing the heat of a second heated roller… a relaxation heat treatment is carried out" (see Applicant's Specification, page 13, ll. 12-30). Thus, Applicant's Specification clarifies that a heat treatment at a second roll is inherently sufficient to provide a relaxation heat treatment between the second heated roll and a third roll or between the second heated roll and a winder. Such inherency is supported by the heat of the roller transferring to the wrapped yarn, which then leaves the roller, and continuing its heat treatment until it cools.

Fujimoto fails to teach that the second heated roll used for the relaxation treatment has a surface roughness of 3 – 6.3 μm.

Rowan is directed to a process for high speed, multi-end polyester yarn (Title). Rowan teaches manufacturing a multi-filament yarn by extruding, passing the filaments through drawing rolls, then through relaxing rolls, and then finally through a conventional air interlacing jet and then wound up (columns 2 and 3). The surface finish (an average surface roughness, R_a) value for the rolls other than the first encountered roll can be between 35 and 120 microinches (0.89 – 3.0 μm) (c. 4, ll. 10 – 20). Rowan suggests that the use of matte rollers produces a yarn with excellent mechanical qualities (c. 4, ll. 25 – 40).

Rowan does not appear to explicitly teach that the R_{max} surface roughness measured according to JIS B0601 is within the claimed range (e.g., 3 – 6.3 μm).

However, in this regard, Rowan teaches a surface finish (an average surface roughness, R_a) can be between 35 and 120 microinches (0.89 – 3.0 μm) (c. 4, ll. 10 – 20). Since the average value is below the maximum value in a range, when Rowan's average roughness R_a is 3.0 μm, Rowan's maximum surface roughness R_{max} would be at least 3.0 μm. Rowan further teaches making the surface smooth (see c. 5, l. 4), which would minimize the variation in the surface and keep the maximum surface roughness close to the average surface roughness. As such, Rowan recognizes that the respective R_{max} is a result-effective variable. Since R_{max} is a result-effective variable, one of ordinary skill in the art would have obviously been motivated to determine the optimum R_{max} applied in the process of Rowan through routine experimentation based upon

minimizing the variation within R_a to maximize smoothness of the matte roller (see c. 5, l. 4 and c. 3, l. 54 through c. 4, l. 5).

Since Fujimoto lacks disclosure to specific details about the surface roughness of the second heated roller, it would have been necessary and thus obvious for one of ordinary skill in the art practicing the invention of Fujimoto to look to the prior art as exemplified by Rowan to provide the details of the relaxation roller's surface texture. As heated matte rollers having a temperature of at least 140 °C and a surface finish value of 0.89 – 3.0 micrometers which has a relaxation between 1 – 10 percent produces a yarn with excellent mechanical qualities (see Rowan, c. 4, ll. 33-35), it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the heated matte finish relaxation rollers of Rowan in the invention of Fujimoto, motivated by the expectation of successfully practicing the invention of Fujimoto and in order to produce a yarn with excellent mechanical qualities (see Rowan, c. 4, ll. 25 – 40).

The claimed step of preventing the multi-filament yarn from winding back onto the second heated roll during the relaxation heat treatment is stated by the claim to result from reducing the frictional coefficient via a claimed surface roughness and temperature. Fujimoto teaches the claimed second heated roller temperature as described above, and Rowan, as combined, teaches the claimed surface roughness. Thus, Fujimoto in view of Rowan teach the claims steps for preventing the multi-filament yarn from winding back onto the second heated roll.

Fujimoto fails to expressly teach intermingling to a specific CF value.

Toshio teaches interlacing to a CF value of 10-100 with a synthetic multifilament fiber (Abstract).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Toshio's CF value with Fujimoto's process of making filaments and intermingling in order to provide sufficient intermingling to manufacture a fabric without requiring sizing (see Toshio) and to give a fabric thus obtained excellent softness, stretchability properties, and color developing properties (see Fujimoto [0044]).

Fujimoto in view of Rowan and Toshio teach that the breaking extension of the yarn is 40% or more, the strength from a stress-strain curve of at least 3 cN/dtex, a Young's modulus of no more than 25 cN/dtex, a minimum value of a differential Young's modulus at 3-10% elongation of no more than 6.6 CN/dtex, and an elastic recovery following 10% elongation of at least 90% principally because they teach the same claimed process.

Fujimoto teaches that winding PTT yarn is improved by cooling the yarn before winding to 0-50 °C by blowing a cold wind and that such a cooling process helps to prevent tight winding (cools the multifilament yarn; controls tension gradient) [0041]. As described above, Fujimoto teaches that the yarn is mixed by methods such as interlacing before incorporating the yarn into fabric (subjecting the multi-filament yarn to an interlacing treatment) [0045], and Rowan, as combined, teaches passing the filaments through drawing rolls and then finally through a conventional air interlacing jet and then wound up (subjecting the multifilament yarn to an interlacing treatment with an

interlacing treatment nozzle that controls tension gradient) (see cols. 2 and 3). Thus, Fujimoto in view of Rowan and Toshio teach cooling before winding, controlling tension before winding, and interlacing between drawing and winding. However, Fujimoto in view of Rowan and Toshio do not appear to expressly teach an interlacing treatment nozzle controls tension gradient.

Palmer teaches that it is well known to operate interlacing jets with air at room temperature (see c. 1, ll. 42-50).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to operate the interlacing jets with air at room temperature as taught by Palmer in the interlacing step of Fujimoto in view of Rowan and Toshio because interlacing with air at room temperature is well known (see Palmer, c. 1, ll. 42-50), interlacing air temperature effects the yarn temperature (see Palmer, c. 2, ll. 57-64), and cooling PTT before winding beneficially avoids tight winding (controls tension gradient) (see Fujimoto, [0041]).

Fujimoto teaches that the fiber can be in the form of a twisted yarn [0045]. Fujimoto teaches that in one embodiment the polyester fiber described in the reference can be used as the warp or weft of a woven fabric [0045].

Fujimoto fails to teach that the twist coefficient is 10,000 – 20,000.

Matsuo teaches a woven material comprising polytrimethylene terephthalate in which the weft has a twisting coefficient of 10,000 - 30,000 (Abstract).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to create the yarn of Fujimoto with a twisting coefficient as

suggested by Matsuo motivated by the expectation to provide a fabric having stretchability (see Matsuo, abstract).

With respect to the claim limitation of "nozzle," the interlacing jets taught by Fujimoto, Rowan, Palmer, and Matsuo necessarily include a nozzle because of the acceleration mechanics of a jet.

However, if it is held that a jet does not necessarily include a nozzle for acceleration, Negishi teaches using a fluid jet nozzle within an air jet interlacing apparatus (see abstract and c. 8, ll. 14-21).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use fluid jet nozzle as taught by Negishi in the interlacing apparatus of Fujimoto in order to provide interlaced yarn that contains a desired degree of interlacing for subsequent processing, is free of undesired lengths without interlacing, and requires minimal air jetting for the desired degree of compactness (see Negishi, c. 1, l. 63 through c. 2, l. 12).

With respect to Claim 16, Fujimoto teaches that the intrinsic viscosity of the polymer is 0.4 – 1.5, preferably 0.7 – 1.2 (intrinsic viscosity at least 0.8) [0016].

As to claim 17, Fujimoto teaches that multifilaments are extruded from a spinning machine at a temperature from 250 – 290 °C [0033], which is 22 – 62°C higher than the melt temperature.

With respect to Claim 18, Fujimoto teaches that the fibers are drawn on the first roll heated at 30 – 80 °C having a peripheral speed of 300 to 3,500 m/min without winding thereon (>3,000 m/min) [0035].

With respect to Claim 19, Fujimoto teaches in Example 13 that the relaxation ratio is 0.88 (see Table 1 continued, Example 13), which is equivalent to a relaxation factor of 12%.

With respect to Claim 22, the draw temperature is -15 – 35 °C higher (10-50 °C higher) than the glass transition temperature of poly (trimethylene terephthalate), which is 45 °C.

With respect to Claim 24, Fujimoto teaches that the draw ratio can be 2.20 in Example 13. The Examiner considers a draw ratio of 2.20 to be a "low" draw rate as required by Applicant. Fujimoto in view of Rowan and Toshio teach having strength from a stress/strain curve of at least 3cN/dtex and a breaking extension of at least 42% principally because they teach the same claimed process.

Response to Arguments

Applicant's arguments filed 03 August 2011 have been fully considered, but they are not persuasive.

Applicant argues with respect to the 35 U.S.C. § 103(a) rejections. Applicant's arguments appear to be on the grounds that:

1) Fujimoto's failure to teach Applicant's newly amended limitation of R_{max} of 3 – 6.3 μm is not obvious over Rowan's teaching of R_a being optimized since the motivation presented—to achieve a smooth surface—would lead one of ordinary skill in the art at the time the invention was made away from Applicant's subject matter of having a rough surface to prevent reverse winding at 20% relaxation.

2) The essence of Rowan's teaching is to have a roll surface roughness value of 35 to 120 microinches. Modification away from this smoothness is away from the essence of Rowan's invention.

The Applicant's arguments are addressed as follows:

1)Applicant's arguments with respect to the newly claimed limitation of 3 – 6.3 μm as the R_{max} surface roughness measured according to JIS B0601 have been considered but are moot in view of the new ground(s) of rejection.

1) As recited above, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize Rowan's teachings to obtain the claimed surface roughness:

> Fujimoto fails to teach that the second heated roll used for the relaxation treatment has a surface roughness of 3 – 6.3 μm.
>
> Rowan is directed to a process for high speed, multi-end polyester yarn (Title). Rowan teaches manufacturing a multi-filament yarn by extruding, passing the filaments through drawing rolls, then through relaxing rolls, and then finally through a conventional air interlacing jet and then wound up (columns 2 and 3). The surface finish (an average surface roughness, R_a) value for the rolls other than the first encountered roll can be between 35 and 120 microinches (0.89 – 3.0 μm) (c. 4, ll. 10 – 20). Rowan suggests that the use of matte rollers produces a yarn with excellent mechanical qualities (c. 4, ll. 25 – 40).

Rowan does not appear to explicitly teach that the R_{max} surface roughness measured according to JIS B0601 is within the claimed range (e.g., 3 – 6.3 μm).

However, in this regard, Rowan teaches a surface finish (an average surface roughness, R_a) can be between 35 and 120 microinches (0.89 – 3.0 μm) (c. 4, ll. 10 – 20). Since the average value is below the maximum value in a range, when Rowan's average roughness R_a is 3.0 μm, Rowan's maximum surface roughness R_{max} would be at least 3.0 μm. Rowan further teaches making the surface smooth (see c. 5, l. 4), which would minimize the variation in the surface and keep the maximum surface roughness close to the average surface roughness. As such, Rowan recognizes that the respective R_{max} is a result-effective variable. Since R_{max} is a result-effective variable, one of ordinary skill in the art would have obviously been motivated to determine the optimum R_{max} applied in the process of Rowan through routine experimentation based upon minimizing the variation within R_a to maximize smoothness of the matte roller (see c. 5, l. 4 and c. 3, l. 54 through c. 4, l. 5).

Since Fujimoto lacks disclosure to specific details about the surface roughness of the second heated roller, it would have been necessary and thus obvious for one of ordinary skill in the art practicing the invention of Fujimoto to look to the prior art as exemplified by Rowan to provide the details of the relaxation roller's surface texture. As heated matte rollers having a temperature of at least 140 °C and a surface finish value of 0.89 – 3.0 micrometers which has a relaxation between 1 – 10 percent produces a yarn with excellent mechanical

qualities (see Rowan, c. 4, ll. 33-35), it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the heated matte finish relaxation rollers of Rowan in the invention of Fujimoto, motivated by the expectation of successfully practicing the invention of Fujimoto and in order to produce a yarn with excellent mechanical qualities (see Rowan, c. 4, ll. 25 – 40).

The claimed step of preventing the multi-filament yarn from winding back onto the second heated roll during the relaxation heat treatment is stated by the claim to result from reducing the frictional coefficient via a claimed surface roughness and temperature. Fujimoto teaches the claimed second heated roller temperature as described above, and Rowan, as combined, teaches the claimed surface roughness. Thus, Fujimoto in view of Rowan teach the claims steps for preventing the multi-filament yarn from winding back onto the second heated roll.

1) Moreover, the suitability of the finish of Rowan's roller at a 20% relaxation rate is moot in view of Rowan's disclosure of suitability of a relaxation rate of 1-10% (see Rowan, c. 4, ll.5-7), which is within the claimed range of 10-20%.

2) As combined, Rowan's teaching of an average surface roughness R_a between 35 and 120 microinches is not modified. Thus, discussion of whether modification of the average surface roughness R_a or maximum surface roughness R_{max} would be counter to the essence of Rowan is moot. More specifically, the optimization of maximum surface roughness R_{max} is within the maximum surface roughness R_{max} boundary of 3.0 μm already set by the Rowan's average surface roughness R_a as recited above:

However, in this regard, Rowan teaches a surface finish (an average surface roughness, R_a) can be between 35 and 120 microinches (0.89 – 3.0 μm) (c. 4, ll. 10 – 20). Since the average value is below the maximum value in a range, when Rowan's average roughness R_a is 3.0 μm, Rowan's maximum surface roughness R_{max} would be at least 3.0 μm.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patrick Butler whose telephone number is (571)272-8517. The examiner can normally be reached on Mon.-Thu. 7:30 a.m.-5 p.m. and alternating Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christina Johnson can be reached on (571) 272-1176. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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